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EXAMINER	
ROSARIO-VASQUEZ, DENNIS	

ART UNIT	PAPER NUMBER
2621	8

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/848,017	PETERSON, JOHN	
	Examiner	Art Unit	
	Dennis Rosario-Vasquez	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 03 May 2001.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-48 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-48 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 13 January 2003 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 5.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings were received on January 13, 2003. These drawings are objected:

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

Figure 1 the box labeled as "2 Image Positioner" does not have a reference numeral.

Figure 5A does not have the "α" label as mention in the specification of page 18, line 19.

Figure 6A has a reference numeral "80b" listed twice.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

Page 8, lines 3,10,16 are referring to numeral 60 of figure 1. However, numeral 60 of figure 1 is a "3D Object Incorporator" and not a "two-image positioner" as mentioned with numeral 60 of page 8. A suggestion is to assign a different number for the "two-image positioner" of figure 1.

Page 8, line 19: "by" should be deleted.

Page 9, line 11: The second "relative" of line 11 should be deleted.

Page 14, line 5: insert "be" between "to" and "corrected".

Pages 19-21 have numerous errors such as page 19, line 6: "(206)" should be replaced with "(1206)", and "(FIG. 4F)" should be changed to "(FIG. 6F)". And a better correspondence between figure 6F and the specification at page 19,20 is required: The specification is referring to reference numerals of figure 6F which are not numbered properly.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-14, 17-21, 23-38, 41-45, 47, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (US Patent 5,963,664 A) and in view of Hsu et al. (US Patent 6,078,701 A).

Regarding claims 25-48, Kumar teaches that the image processing system is used on a computer that is programmed at col. 4, lines 59-60.

Regarding claims 1 and 25, Kumar et al. discloses a method comprising:

determining an orientation (Figure 3 is a geometric representation at Kumar et al.: col. 5, line 63) of a camera (Kumar et al.: fig. 3, label "O" and "M" are focal centers of each camera at col. 6, lines 3,4.) associated with a first image (Kumar et al.: fig. 3, num. 304) based on a shape (Kumar aligns images using regions as a shape at

col. 7 line 64 thru col. 8, line 2) of a corrected version (Using figure 3,the image, num. 304 or first image is warped to num. 302 or the reference image at col. 6, lines 6-9) of the first image, wherein the corrected version of the first image has less perspective distortion (Warping is performed to align images 302 and 304 at col. 6, lines 6-9) relative to a reference image (fig. 3, num. 302) than the first image and the shape of the corrected version of the first image is different (The first image is warped) from the shape of the first image; and

projecting the first image on a surface (Images 302 and 304 are aligned to surface S of figure 3, numeral 300) based on the orientation of the camera associated with the first image.

Kumar et al. does not teach the use of a perimeter as a shape.

However, Hsu et al. does teach a use of perimeter for aligning images at col. 11, line 11.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the perimeter teaching of Hsu et al. instead of using the regions of Kumar et al. because "In practice, only a subset of points is selected. Indeed, the local registration technique might only determine... [a mapping]... for a sparse set of points, not the entire overlap between images i and j, for reasons of efficiency or lack of image features. Even if...[a mapping]... were known everywhere, it is neither efficient nor necessary to sum over all points (Hsu et al. at col. 11, lines 1-6)."

Regarding claims 2 and 26, Kumar et al. teaches the method of claim 1 further comprising:

determining a focal length (The focal length of a camera is predetermined at col. 4, lines 51-53) of a camera associated with the first image based on the shape of the perimeter of the corrected version of the first images, wherein the step of projecting the first image is further based on the focal length (Kumar et al. uses perspective projection with a focal length at col. 5, lines 52-62.).

Claims 3 and 27 were addressed in claim 1 above.

Regarding claims 4 and 28, Kumar et al. teaches the method of claim 3 further comprising:

merging the projected reference image and the projected first image to form a panoramic image (Kumar et al. uses a plurality of images that are combined to form a panoramic image at col. 3,lines 61-65).

Regarding claims 5 and 29, Kumar et al. teaches the method of claim 3 further comprising:

projecting a three-dimensional object onto the surface (Kumar states, “More particularly, the parallax field represents the objects that lie in front of and behind the parametric surface and the distance (height) of these objects from the surface, i.e., the three-dimensional geometry of the scene (col. 4, lines 45-49).”);

merging the projected three-dimensional object, the reference image and the first image to form a panoramic image (The “P-then-P” method initially registers two images then determines the said parallax field at col. 4, lines 6-10.).

Regarding claims 6-8 and 30-32, Kumar et al. teaches using a parametric surface at col. 4, line 2.

Regarding claims 9 and 33, which is similar to claim one except for requiring a second image. Kumar et al. teaches the method of claim 9 as shown in claim 1 above of a plurality of images as shown in fig. 2, numerals 200.

Regarding claims10 and 34, Kumar et al. teaches the method of claim 2 wherein determining the focal length and rotation angle further comprises:

selecting initial values ("initial parameter values" at col. 8, line 35 are shown in col. 7, equation "(5)" and are part of the "Sequential Registration" process at col. 6, line 58) for the orientation and the focal length (The parameters values include orientation "Ω" and focal length "f" as shown in equation 5.); and

improving the accuracy (The sequential registration process uses a "coarse-to-fine, iterative manner" at col. 7, line 64,65) of the selected values of the orientation and the focal length by:

estimating the shape (Initially, the entirety of the images are selected as the regions of interest which are used for registering images at col. 8, lines 1-6) of the corrected version of the first image based on the selected values of the orientation and the focal length;

comparing (fig. 4, numeral 414 is an "iterate" query step) the estimated shape and the actual shape (The actual shape is based on a minimizing error function that is calculated for each region for alignment at col. 8 , lines 6-10.)

adjusting the selected values of the orientation and the focal length based on a difference (Equation 8 at column 8 is a sum of squared difference (SSD) measure used for the selected regions or estimated shape) between the estimated shape and the

actual shape of the perimeter of the corrected version of the first image.

Regarding claims 11 and 35, Kumar et al. teaches the method of claim 10 wherein improving the accuracy of the selected values of the orientation and the focal length further comprises:

computing a difference between the selected values of the orientation and the focal length with the adjusted values of the orientation and the focal length;

if the computed difference (SSD) is below a threshold value ("predefined threshold SSD level" at col. 8, line 48):

determining that the adjusted values of the orientation and the adjusted value of the focal length are the actual orientation and the actual focal length (Kumar et al. states," The routine queries, at step 414, whether further computational iterations are necessary to achieve alignment (col.8, lines 45-47).") ;

otherwise, if the computed difference is not below the threshold value:

selecting the adjusted values of the orientation and the focal length as the values of the orientation and the focal length (A current set of parameters are used for the next iteration at col. 8, lines 38-42); and

repeating ("iterively refines the parameters" at col. 8, line 36) the step of improving the accuracy of the selected values of the orientation and the focal length.

Regarding claims 12 and 36, Kumar et al. teaches the method of claim 10 wherein the initial value of the orientation is selected to be an orientation of a camera associated with the reference image (The eight motion parameters (col. 7, equation 5) contain translational views "T" in three directions between cameras are used in determining the initial orientation parameters at col. 7 , lines 38,39 and col. 8, line 35).

Claims 13 and 37 were addressed in claim 1 above.

Regarding claims 14 and 38, Kumar et al teaches the method of claim 10 wherein the initial value of the focal length is selected based on a measurement of the first image (Using figure 4, Kumar et al states,"...the routine estimates, in a coarse-to-fine manner, the motion parameters that align the two images to one another...(col. 8, lines 23-25)." Note that the motion parameters include a focal length.).

Regarding claims 17 and 41, Kumar et al. teaches the method of claim 1 wherein the orientation comprises a rotation angle of the camera (Kumar et al. teaches an angular-velocity at col. 7, line 39).

Claims 18 and 42 are similar to claim one except for requiring an overlap of the first and reference image. Kumar et al. teaches overlapping of at least two images at col. 2, lines 25-28. Kumar et al. also uses selected regions of interest which are overlapping regions at col. 8, lines 42-44.

Regarding claims19 and 43, Kumar et al. teaches the method of claim 18 further comprising:

determining a position offset ("residual displacement" at col. 8 , line 41) of the first segment of the view relative to the reference segment of the view, wherein correcting ("alignment iteration" at col. 8, line 39) for perspective distortion is based on the determined position offset. Therefore, a residual displacement or offset is determined between two images through alignment iteration or correcting.

Regarding claims 20 and 44, Kumar et al. teaches the method of claim 18 wherein the first image includes at least a first reference point and a second reference point (Kumar et al. uses regions and each region contains pixels for each image at col. 8, line 33) correcting for perspective distortion alters the shape of the first image ("transformation...is applied to the inspection image... (Kumar et al. at col.8, lines 39-41).") by moving the first reference point relative to the second reference point (The image regions are matched over selected regions of the images at col. 7, line 66 thru col.8, line 2.)

Kumar et al does not teach the use of a perimeter; however Hsu et al. does teach a use of a perimeter as addressed in claim 1 above.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use a perimeter of Hsu et al. instead of a region as taught by Kumar et al. for the same reason as claim 1 above.

Regarding claims 21 and 45, Hsu et al. teaches the first and second reference points are vertices ("corner points" at Hsu et al., col. 11, line 11) defined by the shape of the perimeter of the first image.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use corner points of Hsu et al. instead of a region as taught by Kumar et al. for the same reason as claim 1 above.

Regarding claims 23 and 47, Kumar et al. teaches the method of claim 1 wherein determining the orientation ("angular velocity" or "Ω" is a variable used to estimate eight motion parameters as shown in column 7, equation 5 at col. 8, lines 30-33) is further

based on the shape ("reference to a region" at col. 8, line 32) of the first image.

Kumar et al does not teach the use of a perimeter; however Hsu et al. does teach a use of a perimeter as addressed in claim 1 above.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use a perimeter of Hsu et al. instead of a region as taught by Kumar et al. for the same reason as claim 1 above.

Regarding claim 24 and 48, Kumar et al. teaches the method of claim 1 wherein the perimeter of the first image has the same shape as the perimeter of the reference image (Kumar states,"...a single camera [can] produce a series of video frames). Therefore each frame, which includes a perimeter, is taken from the same camera.

5. Claims 15 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (US Patent 5,963,664 A) and in view of Hsu et al. (US Patent 6,078,701 A) and further in view of Yevick (US Patent 4,057,338 A).

Regarding claims 15 and 39, Kumar et al teaches the method of claim 14 wherein the selected initial value of the focal length is predetermined, but does not teach the remaining portion of claims 15 and 39.

However, Yevick does teach a focal length is the sum of a length and width of the image. Yevick states that the "focal length is approximately the length of the diagonal of the film (col. 10, lines 10,11)". Therefore, using geometry a diagonal of an image can be determined using a sum of the squares of the lengths of the edges of the image.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to determine the focal length of camera because Yevick teaches a

“known…”rule-of-thumb”…” method that a diagonal of an image is an approximate of the focal length of a camera (col. 10, lines 8-11).

6. Claims 16 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (US Patent 5,963,664 A) and in view of Hsu et al. (US Patent 6,078,701 A) and further in view of Yamada et al. (US Patent 5,802,202 A).

Regarding claims 16 and 40, Kumar et al. teaches the method of claim 10 wherein an iteration (“iterively refines the parameters” at col. 8, line 36) is used to adjust the initial values of the rotation angle and the focal length (The eight motion parameters include a focal length “f” and angular-velocity “Ω” as shown in col. 7, equation 5).

Kumar et al. does not teach using Newton’s iteration; however Yamada, in the analogous field of three dimensional imaging, teaches the use of the “Newton-Raphson method” for solving for a set of parameters to transform an object to a standard coordinate system at col. 29, lines 23-48.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the Newton-Raphson method as taught by Yamada to modify the iteration as taught by Kumar et al. because the Newton-Raphson method quickly deterimines the position of an object for transforming coordinates even when the whole object is difficult to detect at Yamada, col. 29, lines 48-50.

7. Claims 22 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (US Patent 5,963,664 A) and in view of Hsu et al. (US Patent 6,078,701 A) and further in view of Hirosawa et al. (US Patent 5,838,837).

Regarding claim 22 and 46, Kumar teaches a shape of the first image and correcting for perspective distortion alters ("warp" or "transformation" at Kumar, col. 6, line 6 and col. 8, line 39) the shape ("region" at Kumar, col. 8, line 32) of the first image as addressed in claim 1, but does not teach the use of a rectangle or trapezoid as a shape.

However, Hirosawa et al. does teach, in the analogous field of image synthesis, teaches the use of a rectangle (fig. 16A, numerals 84,85,86) and trapezoid (fig. 16B, numerals 84,85',86') for synthesizing images at col. 13, lines 1-45).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use the synthesis teaching as taught by Hirosawa et al. as the shape or region as taught by Kumar et al. because the deformed images reduce clipping of images due to a limited memory space at col. 13, lines 1-7.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Herman et al. (US Patent 6,075,905 A) is pertinent as teaching a method of transforming all images except for a reference image to form a mosaic at col. 15, lines 15-19.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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